

MAR-13

Endangered, Threatened, Vulnerable and
Rare Vascular Plants of the Pennsylvania
Portion of the Upper Delaware
Scenic and Recreational River

Report to the Mid-Atlantic Region
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ABSTRACT

The Pennsylvania portion of the Upper Delaware Scenic and Recreational River was surveyed to determine the presence of Federal and state endangered, threatened, vulnerable and rare plant species. Plants of Special Concern in Pennsylvania, a list issued by the Pennsylvania Bureau of Forestry, and Endangered and Threatened Wildlife and Plants, issued by the United States Fish and Wildlife Service on July 20, 1984, were the basis for the investigation which included herbarium studies and field surveys. One or more populations of six Pennsylvania special concern species were located in or near the Upper Delaware corridor. Of greatest significance was the discovery of two extant populations of Chamisso's miner's-lettuce (Montia chamissoi, Portulacaceae). There is no record, past or present, of any federally listed plant species in the study area.

I. INTRODUCTION

Purpose

This study was undertaken to determine the occurrence of Federal and state endangered, threatened, vulnerable and rare species of vascular plants within the Pennsylvania section of the Upper Delaware Scenic and Recreational River. It is intended to provide National Park Service resource managers, other units of government (Federal, state and local) and private landowners with the information they need to protect important natural features and make informed decisions regarding river use, land use and facility siting issues.

This study was carried out in conjunction with the Pennsylvania Natural Diversity Inventory (PNDI) under the sponsorship of the Pennsylvania Department of Environmental Resources. All data collected on special concern plants have become part of the state-wide PNDI data base.

Under Pennsylvania state regulations, which are expected to be adopted sometime in 1985, it will be illegal for anyone, other than the landowner, to disturb, pick, take, possess, destroy, mutilate, remove, collect or transplant any plant classified as Pennsylvania endangered or Pennsylvania threatened unless a permit has been obtained from the Pennsylvania Department of Environmental Resources. It will also be illegal to disturb, pick or take such species from state forest lands or state parks. The proposed regulations also control the digging, harvesting, sale and exploitation of vulnerable species. However, plants classified as Pennsylvania rare are not accorded any protection.

Federally listed species growing on land under Federal jurisdiction are protected from removal or possession by any person. In addition, under Section 7 of the Endangered Species Act, all Federal agencies are required to insure that any action authorized, funded or carried out by that agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in adverse modification of their habitat.

It should be noted that no constraints are placed on what a private landowner may do on his own property under either the Federal Endangered Species Act or the proposed Pennsylvania state regulations. The purpose of this report is to inform landowners of the presence of valuable natural features and to identify appropriate land management practices for their preservation.

Description of the Study Area

Boundaries - This study encompassed the Pennsylvania side of the Delaware River from the railroad bridge at Millrift to the confluence of the east and west branches at Hancock, NY. The river corridor from the state line to the ridge top was considered, however access problems restricted survey activity in some upland areas. Forty-five miles of the riverbank were surveyed by canoe, from Hancock to Callicoon and from Narrowsburg to Lackawaxen.

Several rare plant sites in the vicinity of Millrift and Matamoras, south of the Upper Delaware Scenic and Recreational River Area, were also included in the survey because of their proximity to the main study area.

Geology - The entire area is characterized by middle and upper Devonian shales, siltstones and sandstone (Willard 1939). The Catskill Formation covers most of the study area and includes extensive deposits of fine-grained blue-gray sandstones (bluestone) which were quarried extensively in the past. In many areas along the river, especially in the vicinity of Pond Eddy, Parkers Glen and Stockport, slopes and uplands show ample evidence of earlier quarrying operations.

The river valley is narrow throughout, often with steep wooded slopes rising directly from the river's edge. Upland soils are derived from clay-rich glacial till and are often poorly drained. Between Narrowsburg and Callicoon there are several stretches of floodplain on the Pennsylvania side. Other floodplain areas occur in the vicinity of Hankins, north of the mouth of Little Equinunk Creek and near Stockport. Floodplain areas consist of fluvial deposits with channel bars and point bars occurring in several locations.

Several small islands lie within the river corridor.

Vegetation - The northern two thirds of the study area lies within the northern hardwood forest zone (Kuchler 1964). Sugar maple, yellow birch, beech and hemlock are the dominant species on the wooded slopes along the river. The southern third of the area falls within the Appalachian oak forest formation (Kuchler 1964). Dominant trees include several species of oaks and hickories. American chestnut was once a significant component. Sheltered areas such as the ravines of tributary streams contain more diverse assemblages of forest trees including basswood, tulip tree, ash and red maple. A floodplain forest dominated by sycamore occurs on level areas along the river.

While the slopes of the Upper Delaware Valley are consistently wooded, the forests are obviously second growth and have long been affected by logging and quarrying operations. Burning practiced by the Indians also modified the forest cover. An observer in 1769 notes the preponderance of short scrubby timber on the hills from Cochection to Lackawaxen (Halsey 1906).

Land Use History - Prior to the arrival of European settlers in the mid 1700's the area was inhabited by native Indian tribes who subsisted by hunting, fishing and some primitive farming. The first successful European settlement was at Cushetunk in the mid-1700's when farms were established on the level floodplains along both sides of the river (Andrefsky and McGregor 1983). Agriculture has been the dominant use in these areas ever since.

The slopes and uplands have been severely impacted by logging and bluestone quarrying. Serious logging activity began in the 1760's when the first log raft was successfully floated 200 miles down the river to Philadelphia (Weiss and Weiss 1967). Rafts up to 210 feet wide and 75 feet long were fashioned to deliver logs to downstream markets. Rafting lasted until about 1900. At the height of the logging activity, the shores of the Upper Delaware were lined with log chutes, saw mills and raft assembly sites (Hoff 1893). Cutting was done during the winter as the rafts could only travel successfully during the spring freshet. White pine was cut first to supply masts for ships. Hemlock was second in demand. Hemlock bark was also harvested to supply the tanning industry (Weiss and Weiss 1967).

Although some bluestone flagstones were transported by raft, bluestone quarrying reached its peak after construction of the New York and Erie railroad through the valley in 1848 (Andrefsky and McGregor 1983). Today, on the valley slopes overgrown spoil piles and quarry pits are a common sight. The railroad parallels the river on the Pennsylvania side from Millrift to Ten Mile River.

Water Quality - A study conducted by the Delaware River Basin Commission in 1981 concluded that water quality in the Upper Delaware was good to excellent throughout (Albert 1981).

Plant List

The basis for the herbarium investigation and field survey were species listed under the Federal Endangered Species Act and the list, Plants of Special Concern in Pennsylvania, issued by the Pennsylvania Natural Diversity Inventory. It must be stressed that the latter list is an evolving document which has undergone several revisions during the period of this project. All Pennsylvania state status designations are in accord with the November 1984 version. This list is scheduled to become the official state rare plant list in 1985. However, as of this writing all state status recommendations are listed as proposed.

Proposed Pennsylvania endangered refers to species which are in imminent danger of extirpation throughout their range in Pennsylvania and are limited to a single biogeographic region or specialized habitat outside the state. Proposed Pennsylvania threatened is applied to species for which available evidence indicates that they may become endangered in the foreseeable future throughout their range in Pennsylvania. The category, proposed Pennsylvania vulnerable, is applied to species and subspecies which may become endangered or threatened because they have some economic value and are thus subject to over-collecting. Proposed Pennsylvania rare is used to distinguish species with limited occurrence within the boundaries of Pennsylvania but greater abundance outside the state. The status, temporarily undetermined, is applied to species with ten or fewer historical localities in Pennsylvania, those restricted to specialized habitats and others for which more current information is necessary before a permanent status can be assigned.

In Federal terms, endangered refers to any species which is in danger of extinction throughout all or a significant portion of its range. Likewise, threatened means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (United States Congress, 1973). In addition, species proposed for Federal listing are accorded C1, C2, or C3 standing. C1 species are those for which sufficient information is presently on hand to support the biological appropriateness of their being listed as endangered or threatened. C2 species require additional biological research and field study to determine their appropriate status and C3 species are those which have been dropped from active consideration for listing. All federally listed species and those proposed for Federal listing have endangered, threatened or vulnerable status on the state list or are believed to be extirpated in Pennsylvania. Criteria for state listing place more emphasis on the status of Pennsylvania populations than do Federal criteria. Therefore, listings of proposed Pennsylvania endangered and threatened plants include many species which are not so classified on the Federal list.

References to New York status are based on Mitchell and Sheviak (1981).

Nomenclature

Kartesz and Kartesz (1980) provided the standard for nomenclature of all species discussed in this report. Relevant synonymy is included in the section on each species.

II. METHODS

Herbarium Search

Using the list Plants of Special Concern in Pennsylvania and the Federal endangered species list as a basis, historical information was sought through the Pennsylvania Natural Diversity Inventory data base in Harrisburg, the Atlas of the Flora of Pennsylvania (Wherry et al., 1979) records at the Morris Arboretum, and Academy of Natural Sciences Herbarium in Philadelphia.

Field Survey

A three person field team spent a total of fourteen days in the Upper Delaware during 1983 and 1984. Team members included botanists and field biologists. Field report forms used by the Pennsylvania Natural Diversity Inventory to record special plant and site information were completed for each endangered, threatened, vulnerable, rare, or tentatively undetermined plant occurrence found. In addition, site forms were completed for all locations where such species were reported in the past even if the plants were found to be no longer present. Plant community forms were also completed for all sites visited including areas with interesting plant communities but no past or present reports of endangered, threatened, vulnerable or rare species. Species lists were also compiled for all sites visited. These lists are not exhaustive but represent all species of vascular plants which could be observed at the time the area was visited.

United States Geological Survey quadrangle maps were used to locate and record each site visited. Whenever possible 35 mm color slides were taken to document the plants and their immediate habitats. Herbarium specimens have been deposited with the Morris Arboretum and the Philadelphia Academy of Natural Sciences.

III. RESULTS

Species

The herbarium search resulted in records for six species from the Plants of Special Concern in Pennsylvania list from within or near the Upper Delaware Scenic and Recreational River (UDSRR). Twenty-two extant populations representing six species presently or formerly included on the Pennsylvania state list were located during the field survey including one species for which there were no previous records. Two species collected in the past could not be relocated. No herbarium records or extant populations of Federally listed species were found.

The annotated species list includes information on the status and significance of each species which was reported and/or found. Table 1 summarizes this information for all species.

Worth noting because of its size, rather than its rarity, is an individual specimen of black maple (Acer nigrum) located on the river floodplain approximately one mile south of Milanville. This tree, which has a circumference of seventeen feet eleven inches at a height of four and one half feet, is the largest of its kind in the state. Data on it has also been submitted to the National Register of Big Trees of the American Forestry Association.

Sites

Seven sites were identified within the Upper Delaware corridor which contain plants currently on the Plants of Special Concern in Pennsylvania list. The two most significant sites contain two newly discovered populations of Chamisso's miner's-lettuce (Montia chamissoi). In addition, three stands of prostrate sand cherry (Prunus pumila var. depressa) and two stands of checkered rattlesnake plantain (Goodyera tessellata) were recorded. In addition, riverbank quillwort (Isoetes riparia) was found at thirteen sites along the edge of the river between Hancock and Pond Eddy. Previously included in the Plants of Special Concern list, this species was deleted in the November 1984 revision after it was found to be more abundant than previously thought. Isoetes is included in this report because any significant deterioration in the present population could reduce its numbers to a critical level.

Two other rare plants are described in this report which do not actually occur within the Upper Delaware corridor, but are of close enough proximity to be of concern. They are roseroot stonecrop (Sedum rosea) and prickly pear cactus (Opuntia humifusa).

Plant Communities

Information recorded on plant community forms and site species lists was used to compile a list of plant community types present in the Upper Delaware. Community types described, with the exception of #1 and #3, are consistent with the classification of natural communities in Pennsylvania developed by the Pennsylvania Natural Diversity Inventory. Areas of shallow, slow moving water along the riverbank and backwater areas and flood scoured riparian strips could not be fitted in to any of the categories in the PNDI plant community classification scheme. A total of fifteen plant community types were described:

- 1) Shallow, slow moving water along riverbank and backwater areas characterized by scattered aquatic and emergent species. These occur at many locations along the river.
- 2) River gravel community. This category refers to cobble deposits found along the Delaware River, usually at the mouths of tributary streams. These areas are under water part of the year. An excellent example is found at the mouth of Little Equinunk Creek. On slightly higher ground, alluvial sand and cobble flats are found. These areas are severely scoured by seasonal flooding, but can be quite xeric during dry periods in the summer and fall. Good examples are found 1/2 mile north and 2 miles south of Milanville.

- 3) Riparian strips along the riverbank. This vegetation zone occupies the area between seasonal high and low water and is subject to severe flood and ice scouring action. The vegetation consists mainly of herbaceous species.
- 4) Floodplain forest. This community type is limited for the most part to narrow strips along the river, as the broader floodplain sites have long been cleared for agricultural use.
- 5) Xeric conifer forest. One river terrace area near Sparrowbush contains a forest dominated by pitch pine (Pinus rigida).
- 6) Dry/mesic acidic forest. Dry wooded slopes in the southern portion of the Upper Delaware area are characterized by an extension of the Appalachian oak forest type. Dominant trees are species of oak and hickory. This forest type occurs from Millrift to Pond Eddy approximately.
- 7) Mesic forest. Stream ravines leading down into the river valley are the location of a mesic deciduous forest which often includes some hemlock (Tsuga canadensis). Good examples are found between Millrift and Lackawaxen.
- 8) Talus slope forest. This community type, near the base of rocky slopes in ravines along the river valley, contains many of the same species as community type #7. A good example can be found 1 mile west of Pond Eddy.
- 9) Northern hardwood/conifer forest. This is the dominant upland forest type in the northern two-thirds of the Upper Delaware area.
- 10) Riverside seep community. Several sites of this type are located along the river.

- 11) Riverside cliff/outcrop community. This type of plant habitat occurs along the railroad at intervals, as well as along the river just south of Millrift.
- 12) Shale cliff community. This plant community is characterized by xeric tree and herbaceous species.
- 13) Glacial bog. Several areas of this type occur in conjunction with upland lakes or ponds. An example is found near a small lake north of Milanville.
- 14) Graminoid marsh. This refers to a wetland dominated by grasses, sedges or rushes. This type of plant community is present in the vicinity of Pond Eddy.
- 15) Lakes and ponds. Although infrequent, there are a few small lakes and ponds in upland areas along the Upper Delaware. One such is the result of beaver activity on Pond Eddy Creek and another such was created by a manmade dam on Stockport Creek.

Composite species lists based on field observations for each plant community type are presented in Table 2.

ANNOTATED SPECIES LIST

Chenopodium foggii H. A. Wahl

(Fogg's goosefoot)

FAMILY: Chenopodiaceae

SYNONYMS: None

STATUS:

Federal: None

PA: Temporarily undetermined

NY: Not listed

Other States: NA

DESCRIPTION: Annual herbaceous plant, slenderly upright, 2-10 dm tall, branched or unbranched. Leaves narrowly ovate, 1-4 cm long, 0.5-1.8 cm broad with one or two pairs of teeth below the middle, tapering to a slender petiole. Flowers in short spikes near the top of the plant. Fruit covered at maturity by 5 persistent sepals. Seed black and shining, 1 mm in diameter.

HABITAT: Dry, rocky woodlands and slopes.

DISTRIBUTION:

Total: Quebec and ME south to NC and west to IL and MN.

PA: Reported from 4 northeastern counties and one site in western PA.

UDSRR:

Herbarium Records:

Matamoras, 1938

Field Survey: This species was not found during the 1983-84 field survey.

SIGNIFICANCE OF LOCAL POPULATIONS: This species has been reported from seven sites in five counties of Pennsylvania. The most recent report was in 1956. It was named and described as a distinct species by Wahl (1952) but is not so recognized by Fernald (1950) or Gleason (1952).

POPULATION STATUS AND THREATS: NA

Goodyera tessellata Lodd.

(checkered rattlesnake-plantain)

FAMILY: Orchidaceae

SYNONYMS: Epipactis tessellata A. A. Eat.

Peramium tessellata (Lodd.) Heller

STATUS:

Federal: None

PA: Temporarily undetermined

NY: Not listed

Other States: Listed in MD

DESCRIPTION: Perennial with basal, fleshy pubescent leaves which are green with an intricate network of lighter colored veins. Flowering stalk 1-3.5 dm high with loosely spiralling raceme. Flowers with bulbous-saccate lip, white.

HABITAT: Rich coniferous or hardwood upland forests.

DISTRIBUTION:

Total: Newfoundland to eastern Manitoba south to NY, MI, WI, MN.

PA: Reported from 5 northern counties.

UDSRR:

Herbarium Records:

None

Field Survey: Found at two sites.

SIGNIFICANCE OF LOCAL POPULATIONS: The two populations of this species found during the field survey constitute a new county record and extend the known

distribution in Pennsylvania to six northern counties. The Pennsylvania sites and those in Maryland represent the southern limit of range for this plant.

POPULATION STATUS AND THREATS: At one site approximately fifty individuals were seen scattered singly and in small clusters through several acres of hemlock forest at the crest of the slope. More may be present in the general area. This site is presently used for seasonal hunting activity which does not pose a threat to the plants.

The other population was limited to 2 plants. Lumbering in the area could threaten this population.

Isoetes riparia Engelm.

(riverbank quillwort)

FAMILY: Isoetaceae

SYNONYMS: None

STATUS:

Federal: None

PA: Proposed rare (1983). Dropped from the list in November 1984.

NY: Not listed

Other States: NA

DESCRIPTION: Herbaceous perennial to 2 dm tall. Leaves tufted from the base, linear upright or recurving, leaf bases swollen and containing sporangia.

Species are separated on the basis of the surface markings on the megaspores.

HABITAT: Fresh or tidal shores of rivers in shallow, slow moving water with muddy to gravelly substrate.

DISTRIBUTION:

Total: Ontario to ME and south to PA and DE.

PA: Found along the Delaware and Susquehanna Rivers.

UDSRR:

Herbarium Records:

Damascus, 3 mi. NNE, no date

Stockport, 2 1/2 mi. N, no date

Field Survey: Found at thirteen sites along the Delaware River.

SIGNIFICANCE OF LOCAL POPULATIONS: This species is well represented along the upper Susquehanna and lower Delaware Rivers in addition to the Upper Delaware sites. Because of its relative abundance on these river systems, it has been deleted in the most recent revision of the Plants of Special Concern list. However, any significant reduction in its numbers would result in its being included in future versions of the list.

POPULATION STATUS AND THREATS: Populations are limited to a few plants at each site. Because this species grows in shallow water at the edge of the river, it is very vulnerable to trampling or abrasion caused by the launching or landing of canoes.

Continued monitoring of this species should be carried out to determine if the population is declining dangerously.

Juncus filiformis L.

(thread rush)

FAMILY: Juncaceae

SYNONYMS: None

STATUS:

Federal: None

PA: Proposed rare

NY: Not listed

Other States: Listed in MA and WV

DESCRIPTION: Slender rush with filiform culms 1-6 dm high to the inflorescence which is surmounted by an erect involucral leaf nearly as long as the culm and appearing as an extension of it. Stems occurring singly or in clusters along a creeping and forking slender rhizome, sometimes forming large dense mats. Inflorescence a few-flowered cyme.

HABITAT: Sphagnum bogs and wet alpine meadows.

DISTRIBUTION:

Total: Southern Greenland and Labrador to Alaska, south to New England, NY, and the uplands of PA and WV. Also in MI, MN, WY, UT and OR.
Also occurs in Eurasia.

PA: Reported from six northern counties.

UDSRR:

Herbarium Records:

Stockport, 3 mi. below, no date

Field Survey: This species was not observed during the 1983-84 field survey.

SIGNIFICANCE OF LOCAL POPULATIONS: The site near Stockport is the only reported location in Wayne Co. Four extant populations are known in Monroe Co., but several other historical sites have been destroyed. Vacation home development threatens additional areas. This species is more abundant farther north and is approaching the southern limit of its range in Pennsylvania.

POPULATION STATUS AND THREATS: This species could not be located in the area indicated in the herbarium record.

Montia chamissoi (Ledeb. ex Spreng) Greene (Chamisso's miner's-lettuce)

FAMILY: Portulacaceae

SYNONYMS: Claytonia chamissoi Ledeb. ex Spreng

Crunocallis chamissonis (Ledeb. ex Spreng) Rydb.

STATUS:

Federal: None

PA: Proposed endangered

NY: Not known to occur in NY

Other States: NA

DESCRIPTION: Decumbent or ascending weak-stemmed perennial with slender bulblet-bearing runners. Leaves opposite, somewhat succulent, oblong spatulate, 2.5-5 cm long. Flowers with 5 rose colored petals and 2 persistent sepals.

HABITAT: Moist rock ledges.

DISTRIBUTION:

Total: The main range of this plant is from Alaska south to the mountains of CA and AZ. The closest known site to northeastern PA is in MN.

PA: Known from 2 sites along the Delaware River in northern Wayne Co.

UDSRR:

Herbarium Records:

Cochecton Falls, 1893

Damascus, 1/2 mi south, no date

Field Survey: This plant could not be found at the original locations described in the herbarium records, but 2 additional occurrences were discovered.

SIGNIFICANCE OF LOCAL POPULATIONS: The 2 locations on the Upper Delaware are the only sites where this plant is known to occur east of Minnesota. This species has been described as the "most disjunct species in Pennsylvania" (Wherry 1964).

POPULATION STATUS AND THREATS: The populations reported at Cochection Falls and Damascus have apparently been unable to compete with the very aggressive exotic grass (Phalaris arundinacea) which forms a dense stand along the major portions of the riverbank.

Opuntia humifusa (Raf.) Raf. var. humifusa (prickly pear cactus)

FAMILY: Cactaceae

SYNONYMS: O. calcicola Wherry

O. compressa (Salisb.) J. F. Macbr.

O. compressa var. microsperma (Engelm. and Bigelow) L. Benson

O. opuntia (L.) Karst.

O. rafinesquei Engelm.

STATUS:

Federal: None

PA: Proposed rare

NY: Protected native plant

Other States: Listed in MA

DESCRIPTION: Prostrate or spreading, stem segments strongly flattened and jointed, armed with prickles. Flowers solitary, yellow, 5-9 cm across with 8-12 petals. Fruit ovoid, green to dull purple, edible.

HABITAT: Dry sandy and rocky barrens.

DISTRIBUTION:

Total: MA to MN south to SC, GA, AL, MS, and MO.

PA: Recorded from 9 counties across the state.

UDSRR:

Herbarium Records:

Matamoras, 1938

Field Survey: Found in one area south of the UDSRR boundary.

SIGNIFICANCE OF LOCAL POPULATIONS: Additional populations occur in the Delaware Water Gap National Recreation Area and on shale barrens in south central Pennsylvania.

POPULATION STATUS AND THREATS: Population is vigorous and healthy.

Prunus pumila L. var. depressa (Pursh) Gleason (prostrate sand cherry)

FAMILY: Rosaceae

SYNONYMS: P. depressa Pursh

STATUS:

Federal: None

PA: Proposed rare

NY: Not listed

Other States: Listed in MA, MD, NJ, OH, WV, VA

DESCRIPTION: Prostrate deciduous shrub. Leaves oblanceolate to oblong with remotely serrate margins with glandular tipped teeth, pale green above and whitened below. Flowers in clusters of 3 or 4, white; fruit black, subglobose, 10-15 mm diameter.

HABITAT: Alluvial islands and shores.

DISTRIBUTION:

Total: Ontario south to the rivers of MA, PA and WI.

PA: Found along the Delaware River in Pike, Monroe and Northampton Counties.

UDSRR:

Herbarium Records:

Conkling Hill, 2 mi NE, no date

Atco, 2 1/4 mi E, no date

Field Survey: Found at 3 sites.

SIGNIFICANCE OF LOCAL POPULATIONS: This plant occurs along the Delaware River from the Water Gap north (Rhoads et al., 1983) and has been reported from several sites along the Susquehanna, Allegheny and Ohio Rivers.

POPULATION STATUS AND THREATS: Two of the populations are vigorous and healthy and appear secure; their location within a zone subject to annual flooding and scouring by ice precludes many conflicting uses. The other site has just a few scattered plants.

Sedum rosea (L.) Scop.

(roseroot stonecrop)

FAMILY: Crassulaceae

SYNONYMS: Sedum roseum Scop.

Rhodiola rosea L.

Rhodiola roanensis Britt.

STATUS:

Federal: None

PA: Proposed rare

NY: Threatened

Other States: Listed in MN and NC

DESCRIPTION: Smooth, fleshy-leaved perennial with erect stems 3-4 dm high. Leaves pale, glaucous, crowded, spirally arranged, 1-4 cm long. Flowers dioecious in a dense terminal corymb, staminate flowers yellow, pistillate flowers purple, Follicles plum and erect.

HABITAT: Rocky cliffs, in cool moist crevices.

DISTRIBUTION:

Total: An arctic species which extends to ME and locally southward to VT, NY, northeast PA and NC.

PA: Reported from 3 sites along the Delaware River in Bucks and Pike Counties.

UDSRR:

Herbarium Records:

Millrift 1 1/2 mi SE, no date

Mouth of the Lackawaxen River, 1959

Field Survey: Found at one site south of the UDSRR boundary. This species could not be located in the vicinity of the mouth of the Lackawaxen River.

SIGNIFICANCE OF LOCAL POPULATIONS: This population is one of only two known extant populations of this species in Pennsylvania. More abundant to the north, this species approaches its southern limit of range in Pennsylvania.

POPULATION STATUS AND THREATS: The population appears vigorous and healthy. It's location affords it a high level of protection.

IV. CONCLUSIONS

Decisions regarding appropriate levels of use of the Upper Delaware should take into consideration the presence of several rare plant species along the riverbank. Most critical are the two populations of Montia chamissoi described in this report. This disjunct species, classified as endangered in Pennsylvania, is known from only 2 sites in the state, both within the Upper Delaware Scenic and Recreational River corridor. In order to preserve Montia chamissoi and the three stands of Prunus pumila var. depressa, the sites should be protected from the effects of trampling along the riverbank by excessive numbers of recreationists. In addition, landowners of all sites identified in this report should be made aware of the presence of unusual plants so they can make appropriate decisions regarding land use. These plants are natural resources of statewide and national significance and should be protected from activities which threaten their continued existence.

TABLE 1: SUMMARY OF STATUS OF ENDANGERED, THREATENED, VULNERABLE, AND RARE VASCULAR PLANTS IN THE PENNSYLVANIA PORTION OF THE UPPER DELAWARE SCENIC AND RECREATIONAL RIVER

Species	Herbarium Records	# Sites Confirmed 1983-84	Date of Most Recent Sighting	Proposed PA State Status	Federal Status	Geographic ¹ Affinity	Habitat Type	Potential Threats Within UDSRR
<u>Chenopodium foggii</u> ²	1	0	1938	Temporarily Undetermined	None	-----	dry rocky woodlands	trampling, erosion
<u>Goodyera tessellata</u>	0	2	1984	Temporarily Undetermined	None	SLOR	rich coniferous or hardwood forests	clearing, altered land use
<u>Isoetes riparia</u>	2	13	1984	Rare in 1983 deleted in 1984	None	-----	shallow, slow moving water	trampling
<u>Juncus filiformis</u>	1	0	?	Rare	None	SLOR	sphagnum bogs	draining or flooding of wetlands
<u>Montia chamissoi</u>	2	2	1984	Endangered	None	ELOR	wet rock ledges	trampling, competition from exotic species
<u>Opuntia humifusa</u>	1	1	1984	Rare	None	-----	dry cliffs and barrens	trampling, erosion
<u>Prunus pumila</u> <u>var. depressa</u>	2	3	1984	Rare	None	SLOR	alluvial islands and shores	trampling, clearing and mowing
<u>Sedum rosea</u> ²	2	1	1984	Rare	None	SLOR	rocky cliffs	none apparent

¹SLOR - southern limit of range, ELOR - eastern limit of range.

²Reported sites are south of UDSRR boundary.

Table 2

Species Lists for Plant Community Types

- 1) Shallow, slow-moving water and backwater areas along the Delaware River.

<i>Cabomba caroliniana</i>	<i>Lythrum salicaria</i>
<i>Callitriche</i> sp.	<i>Rorippa sylvestris</i>
<i>Eleocharis acicularis</i>	<i>Rumex altissimus</i>
<i>Eleocharis palustris</i>	<i>Sagittaria graminea</i>
<i>Elodea canadensis</i>	<i>Sagittaria latifolia</i>
<i>Equisetum sylvaticum</i>	<i>Scirpus pungens</i>
<i>Isoetes riparia</i>	<i>Scirpus tabernaemontanii</i>
<i>Juncus acuminatus</i>	<i>Sium suave</i>
<i>Leersia virginica</i>	<i>Sparganium americanum</i>
<i>Lysimachia terrestris</i>	

- 2) River gravel communities

Alluvial cobble deposits

<i>Agrostis stolonifera</i>	<i>Ludwigia palustris</i>
<i>Andropogon gerardii</i>	<i>Lycopus americanus</i>
<i>Apios americana</i>	<i>Lysimachia quadrifolia</i>
<i>Apocynum cannabinum</i>	<i>Lysimachia terrestris</i>
<i>Arctium minus</i>	<i>Mentha arvensis</i>
<i>Asclepias syriaca</i>	<i>Mimulus ringens</i>
<i>Barbarea vulgaris</i>	<i>Muhlenbergia frondosa</i>
<i>Bidens frondosa</i>	<i>Muhlenbergia schreberi</i>
<i>Campanula aparinoides</i>	<i>Myosoton aquaticum</i>
<i>Clematis virginiana</i>	<i>Onoclea sensibilis</i>
<i>Cyperus esculentus</i>	<i>Oxalis europaea</i>
<i>Cyperus strigosus</i>	<i>Parthenocissus quinquefolia</i>
<i>Desmodium canadense</i>	<i>Phalaris arundinacea</i>
<i>Dichanthelium clandestinum</i>	<i>Platanus occidentalis</i>
<i>Dulichium arundinaceum</i>	<i>Polygonum cuspidatum</i>
<i>Echinochloa crusgalli</i>	<i>Polygonum pennsylvanicum</i>
<i>Eleocharis acicularis</i>	<i>Polygonum sachalinense</i>
<i>Elymus riparius</i>	<i>Rorippa sylvestris</i>
<i>Equisetum arvense</i>	<i>Rudbeckia laciniata</i>
<i>Equisetum fluviatile</i>	<i>Rumex altissima</i>
<i>Eupatorium maculatum</i>	<i>Rumex crispus</i>
<i>Eupatorium perfoliatum</i>	<i>Salix nigra</i>
<i>Euthamia graminifolia</i>	<i>Saponaria officinalis</i>
<i>Galium</i> sp.	<i>Scirpus atrocinctus</i>
<i>Helenium autumnale</i>	<i>Scirpus cyperinus</i>
<i>Hypericum ellipticum</i>	<i>Scirpus tabernaemontanii</i>
<i>Hypericum perforatum</i>	<i>Scutellaria lateriflora</i>
<i>Hypericum punctatum</i>	<i>Solidago gigantea</i>
<i>Iris versicolor</i>	<i>Spartina alterniflora</i>
<i>Leersia oryzoides</i>	<i>Spiraea latifolia</i>
<i>Lespedeza repens</i>	<i>Urtica dioica</i>
<i>Linaria vulgaris</i>	<i>Verbena hastata</i>
<i>Lobelia cardinalis</i>	<i>Vitis riparia</i>

Table 2 cont'd.

Alluvial sand and cobble flats

Apocynum cannabinum	Potentilla anserina
Asclepias tuberosa	Potentilla simplex
Centaurea maculosa	Prunus pumila var. depressa
Dianthus deltoides	Rorippa sylvestris
Dichanthelium clandestinum	Rumex acetosella
Galium mollugo	Salix exigua
Lespedeza capitata	Saponaria officinalis
Leucanthemum lacustre	Silene vulgaris
Linaria vulgaris	Solidago gigantea
Lysimachia nummularia	Stellaria longifolia
Phalaris arundinacea	Thelypteris palustris
Platanus occidentalis	

3) Riparian strips along the riverbank

Acalypha rhomboidea	Hypericum ellipticum
Agrostis stolonifera	Hypericum perforatum
Apios americana	Hypericum pyramidatum
Apocynum cannabinum	Juncus acuminatus
Aster simplex	Juncus marginatus
Betula nigra	Juncus pelocarpus
Boehmeria cylindrica	Juncus tenuis
Campanula aparinoides	Lespedeza capitata
Carex gynandra	Leucanthemum lacustre
Carex lurida	Linaria vulgaris
Cicuta bulbifera	Lobelia cardinalis
Conium maculatum	Lycopus americanus
Cuscuta sp.	Lysimachia ciliata
Cyperus esculentus	Lysimachia terrestris
Cyperus strigosus	Lythrum salicaria
Dichanthelium clandestinum	Mentha arvensis
Equisetum fluviatile	Mimulus alatus
Equisetum sylvestris	Mimulus ringens
Eupatorium fistulosum	Myosotis scorpioides
Eupatorium maculatum	Oenothera perennis
Eupatorium perfoliatum	Onoclea sensibilis
Eupatorium purpureum	Oxalis europea
Eupatorium rugosum	Oxalis stricta
Euthamia graminifolia	Panicum dichotomiflorum
Galium mollugo	Panicum rigidulum
Gnaphalium uliginosum	Panicum virgatum
Gratiola aurea	Phalaris arundinacea
Gratiola neglecta	Phleum pratense
Hedyotis caerulea	Polygala verticillata
Helenium autumnale	Polygonum pensylvanicum
Helianthus decapetalus	Polygonum punctatum
Helianthus giganteus	Polygonum sagittatum
Hieracium caespitosum	Potentilla simplex
Hydrocotyle umbellata	Prunus pumila var. depressa

Table 2 Cont'd.

3) Riparian strips along the riverbank (cont'd.)

Ranunculus repens	Scutellaria lateriflora
Rorippa sylvestris	Setaria glauca
Rosa carolina	Silene vulgaris
Rubus allegheniensis	Sium suave
Rubus odoratus	Solidago gigantea
Rumex altissima	Solidago juncea
Rumex crispus	Solidago rugosa
Sagittaria latifolia	Spartina alterniflora
Scirpus atrocinctus	Spiraea latifolia
Scirpus atrovirens	Triadenum virginicum
Scirpus polyphyllus	Zizia aurea

4) Floodplain forest (abbreviated list of characteristic species)

Platanus occidentalis	Robinia pseudoacacia
Populus tremuloides	Salix nigra

5) Xeric conifer forest (abbreviated list of characteristic species)

Pinus rigida	Quercus rubra
Quercus ilicifolia	

6) Dry/mesic acidic forest

Acer pensylvanicum	Dryopteris marginalis
Acer rubrum	Epigaea repens
Acer saccharum	Gaylussacia baccata
Andropogon virginicus	Gentiana clausa
Aralia nudicaulis	Gnaphalium obtusifolium
Asplenium trichomanes	Hamamelis virginiana
Asplenium rhizophyllum	Helianthus divaricatus
Aster simplex	Hieracium gronovii
Baptisia tinctoria	Kalmia angustifolia
Betula lenta	Leucanthemum lacustre
Carex annectens	Linaria vulgaris
Carex festucacea	Lupinus perennis
Carex swanii	Lyonia ligustrina
Castanea dentata	Lysimachia quadrifolia
Ceanothus americanus	Osmunda cinnamomea
Cimicifuga racemosa	Osmunda claytoniana
Comptonia peregrina	Pinus rigida
Dennstaedtia punctilobula	Poa compressa
Diervilla lonicera	Polygala paucifolia

Table 2 Cont'd.

6) Dry/mesic acidic forest (Cont'd.)

<i>Polystichum acrostichoides</i>	<i>Solidago caesia</i>
<i>Populus tremuloides</i>	<i>Solidago gigantea</i>
<i>Pteridium aquilinum</i>	<i>Solidago rugosa</i>
<i>Quercus ilicifolia</i>	<i>Solidago latifolia</i>
<i>Quercus montana</i>	<i>Tephrosia virginiana</i>
<i>Quercus rubra</i>	<i>Toxicodendron radicans</i>
<i>Rhus glabra</i>	<i>Vaccinium angustifolium</i>
<i>Rumex acetosella</i>	<i>Vaccinium pallidum</i>
<i>Salix</i> sp.	<i>Vaccinium stamineum</i>
<i>Sassafras albidum</i>	<i>Verbascum thapsus</i>
<i>Scrophularia marilandica</i>	<i>Viburnum acerifolium</i>
<i>Smilacina racemosa</i>	

7) Mesic forest

<i>Acer pensylvanicum</i>	<i>Carya ovata</i>
<i>Acer saccharum</i>	<i>Cinna latifolia</i>
<i>Actaea rubra</i>	<i>Comptonia peregrina</i>
<i>Adiantum pedatum</i>	<i>Coptis trifolia</i>
<i>Anemone quinquefolia</i>	<i>Corallorhiza trifida</i>
<i>Aquilegia canadensis</i>	<i>Cornus florida</i>
<i>Aralia nudicaulis</i>	<i>Cystopteris bulbifera</i>
<i>Aralia racemosa</i>	<i>Dennstaedtia punctilobula</i>
<i>Arisaema triphyllum</i>	<i>Deparia acrostichoides</i>
<i>Asarum canadense</i>	<i>Dryopteris intermedia</i>
<i>Asplenium trichomanes</i>	<i>Dryopteris marginalis</i>
<i>Aster divaricatus</i>	<i>Dryopteris spinulosa</i>
<i>Athyrium filix-femina</i>	<i>Epipactis helleborine</i>
<i>Berberis thunbergii</i>	<i>Fagus grandifolia</i>
<i>Betula alleghaniensis</i>	<i>Festuca obtusa</i>
<i>Betula lenta</i>	<i>Fraxinus americana</i>
<i>Betula nigra</i>	<i>Fraxinus pensylvanica</i>
<i>Betula papyrifera</i>	<i>Geranium maculatum</i>
<i>Botrychium virginianum</i>	<i>Geranium robertianum</i>
<i>Brachyelytrum erectum</i>	<i>Gymnocarpium dryopteris</i>
<i>Carex bromoides</i>	<i>Hamamelis virginiana</i>
<i>Carex brunnescens</i>	<i>Hedyotis caerulea</i>
<i>Carex communis</i>	<i>Hepatica nobilis</i>
<i>Carex deweyana</i>	<i>Hydrocotyle umbellata</i>
<i>Carex gracillima</i>	<i>Hydrophyllum virginianum</i>
<i>Carex gynandra</i>	<i>Hypoxis hirsuta</i>
<i>Carex intumescens</i>	<i>Ilex verticillata</i>
<i>Carex pensylvanica</i>	<i>Lindera benzoin</i>
<i>Carex plantaginea</i>	<i>Liriodendron tulipifera</i>
<i>Carex platyphylla</i>	<i>Lycopodium clavatum</i>
<i>Carex rosea</i>	<i>Maianthemum canadense</i>
<i>Carex stipata</i>	<i>Medeola virginiana</i>
<i>Carex trisperma</i>	<i>Mitchella repens</i>
<i>Carpinus caroliniana</i>	<i>Mitella diphylla</i>

Table 2 Cont'd.

7) Mesic forest (Cont'd.)

<i>Nyssa sylvatica</i>	<i>Smilacina racemosa</i>
<i>Oryzopsis racemosa</i>	<i>Smilax herbacea</i>
<i>Osmunda cinnamomea</i>	<i>Thalictrum dioicum</i>
<i>Osmunda claytoniana</i>	<i>Thelypteris noveboracensis</i>
<i>Ostrya virginiana</i>	<i>Thelypteris phegopteris</i>
<i>Pinus strobus</i>	<i>Tiarella cordifolia</i>
<i>Polypodium virginianum</i>	<i>Tilia americana</i>
<i>Polystichum acrostichoides</i>	<i>Trientalis borealis</i>
<i>Populus tremuloides</i>	<i>Trillium erectum</i>
<i>Potentilla canadensis</i>	<i>Tsuga canadensis</i>
<i>Prunus serotina</i>	<i>Uvularia perfoliata</i>
<i>Quercus alba</i>	<i>Uvularia sessififolia</i>
<i>Quercus montana</i>	<i>Vaccinium angustifolium</i>
<i>Quercus rubra</i>	<i>Viola conspersa</i>
<i>Rhododendron maximum</i>	<i>Viola macloskeyi</i>
<i>Sambucus racemosa</i>	<i>Vitis aestivalis</i>
<i>Sisyrinchium</i> sp.	<i>Vitis labrusca</i>

8) Talus slope forest

<i>Berberis thunbergii</i>	<i>Geranium robertianum</i>
<i>Brachyelytrum erectum</i>	<i>Hamamelis virginiana</i>
<i>Carex gracillima</i>	<i>Hydrophyllum virginianum</i>
<i>Carex platyphylla</i>	<i>Lindera benzoin</i>
<i>Carpinus caroliniana</i>	<i>Oryzopsis racemosa</i>
<i>Carya ovata</i>	<i>Ostrya virginiana</i>
<i>Festuca obtusa</i>	<i>Quercus rubra</i>
<i>Fraxinus americana</i>	<i>Staphylea trifolia</i>
<i>Galium asprellum</i>	<i>Tilia americana</i>
<i>Galium triflorum</i>	<i>Vitis labrusca</i>

9) Northern hardwood/conifer forest

<i>Acer rubrum</i>	<i>Botrychium virginianum</i>
<i>Acer saccharum</i>	<i>Carex aestivalis</i>
<i>Adiantum pedatum</i>	<i>Carex blanda</i>
<i>Amelanchier canadensis</i>	<i>Carex communis</i>
<i>Anemone quinquefolia</i>	<i>Carex conjuncta</i>
<i>Aquilegia canadensis</i>	<i>Carex deweyana</i>
<i>Arisaema triphyllum</i>	<i>Carex folliculata</i>
<i>Asclepias exalbescens</i>	<i>Carex howei</i>
<i>Asplenium trichomanes</i>	<i>Carex stipata</i>
<i>Aster divaricatus</i>	<i>Carex swanii</i>
<i>Aster umbellatus</i>	<i>Carpinus caroliniana</i>
<i>Athyrium filix-femina</i>	<i>Circaea alpina</i>
<i>Betula alleghaniensis</i>	<i>Circaea lutetiana</i>

Table 2 (Cont'd.)

9) Northern hardwood/conifer forest (Cont'd.)

<i>Coptis trifolia</i>	<i>Pinus strobus</i>
<i>Corylus cornuta</i>	<i>Poa sylvestris</i>
<i>Cypripedium acaule</i>	<i>Podophyllum peltatum</i>
<i>Dennstaedtia punctilobula</i>	<i>Polygala paucifolia</i>
<i>Dryopteris cristata</i>	<i>Polygonatum biflorum</i>
<i>Dryopteris intermedia</i>	<i>Polypodium virginianum</i>
<i>Dryopteris marginalis</i>	<i>Polystichum acrostichoides</i>
<i>Epigaea repens</i>	<i>Potentilla simplex</i>
<i>Eupatorium rugosum</i>	<i>Prenanthes altissima</i>
<i>Fagus grandifolia</i>	<i>Pteridium aquifolium</i>
<i>Fraxinus americana</i>	<i>Pyrola americana</i>
<i>Galium trifidum</i>	<i>Quercus alba</i>
<i>Gaultheria procumbens</i>	<i>Quercus montana</i>
<i>Geranium maculatum</i>	<i>Quercus rubra</i>
<i>Geranium robertianum</i>	<i>Rhododendron maximum</i>
<i>Hamamelis virginiana</i>	<i>Rhododendron periclymenoides</i>
<i>Hedyotis caerulea</i>	<i>Ribes cynosbati</i>
<i>Hepatica nobilis</i>	<i>Rubus hispidus</i>
<i>Hydrocotyle umbellata</i>	<i>Saxifraga virginensis</i>
<i>Ilex montana</i>	<i>Solidago flexicaulis</i>
<i>Impatiens capensis</i>	<i>Thelypteris phegopteris</i>
<i>Kalmia latifolia</i>	<i>Tiarella cordifolia</i>
<i>Liriodendron tulipifera</i>	<i>Tilia americana</i>
<i>Luzula multiflora</i>	<i>Trientalis borealis</i>
<i>Lycopodium digitatum</i>	<i>Trillium undulatum</i>
<i>Lycopodium obscurum</i>	<i>Tsuga canadensis</i>
<i>Maianthemum canadense</i>	<i>Vaccinium angustifolium</i>
<i>Medeola virginiana</i>	<i>Vaccinium corymbosum</i>
<i>Mitchella repens</i>	<i>Vaccinium pallidum</i>
<i>Mitella diphylla</i>	<i>Veratrum viride</i>
<i>Nyssa sylvatica</i>	<i>Veronica officinalis</i>
<i>Onoclea sensibilis</i>	<i>Viola cucullata</i>
<i>Osmunda cinnamomea</i>	<i>Viola macloskeyi</i>
<i>Osmunda claytoniana</i>	<i>Viola rostrata</i>
<i>Parthenocissus quinquefolia</i>	
<i>Pilea pumila</i>	

Table 2 Cont'd.

10) Riverside seep community

<i>Acer pensylvanicum</i>	<i>Lythrum salicaria</i>
<i>Asplenium trichomanes</i>	<i>Mentha arvensis</i>
<i>Aster acuminatus</i>	<i>Moehringia lateriflora</i>
<i>Aster lateriflorus</i>	<i>Montia chamissoi</i>
<i>Athyrium filix-femina</i>	<i>Myosotis scorpioides</i>
<i>Betula alleghaniensis</i>	<i>Onoclea sensibilis</i>
<i>Campanula aparinoides</i>	<i>Poa pratensis</i>
<i>Cardamine hirsuta</i>	<i>Poa trivialis</i>
<i>Chelone glabra</i>	<i>Polygonum caespitosum</i>
<i>Chrysosplenium americanum</i>	<i>Polygonum sagittatum</i>
<i>Cystopteris fragilis</i>	<i>Polypodium virginianum</i>
<i>Diervilla lonicera</i>	<i>Ranunculus repens</i>
<i>Epilobium coloratum</i>	<i>Rhododendron sylvestris</i>
<i>Eupatorium maculatum</i>	<i>Rubus odoratus</i>
<i>Euthamia graminifolia</i>	<i>Rubus pubescens</i>
<i>Galium asprellum</i>	<i>Rumex crispus</i>
<i>Gratiola aurea</i>	<i>Rumex obtusifolius</i>
<i>Helenium autumnale</i>	<i>Sagina procumbens</i>
<i>Hydrocotyle umbellata</i>	<i>Sanguisorba canadensis</i>
<i>Hypericum ellipticum</i>	<i>Saxifraga pensylvanica</i>
<i>Impatiens capensis</i>	<i>Scutellaria lateriflora</i>
<i>Juncus acuminatus</i>	<i>Scutellaria nervosa</i>
<i>Juncus tenuis</i>	<i>Spiraea latifolia</i>
<i>Lycopus americana</i>	<i>Stellaria longifolia</i>
<i>Lysimachia ciliata</i>	<i>Thalictrum dioicum</i>
<i>Lysimachia terrestris</i>	<i>Thelypteris phegopteris</i>
	<i>Tsuga canadensis</i>

11) Riverside cliff/outcrop community

<i>Acalypha rhomboidea</i>	<i>Aster umbellatus</i>
<i>Acer rubrum</i>	<i>Athyrium filix-femina</i>
<i>Acer spicatum</i>	<i>Betula lenta</i>
<i>Achillea millefolium</i>	<i>Bidens cernua</i>
<i>Agrostis scabra</i>	<i>Bidens frondosa</i>
<i>Allium canadense</i>	<i>Bidens tripartita</i>
<i>Alnus serrulata</i>	<i>Boehmeria cylindrica</i>
<i>Ambrosia artemisiifolia</i>	<i>Brachyelytrum erectum</i>
<i>Ambrosia trifida</i>	<i>Callitriche heterophylla</i>
<i>Andropogon gerardii</i>	<i>Campanula rotundifolia</i>
<i>Apocynum cannabinum</i>	<i>Cardamine pensylvanica</i>
<i>Aquilegia canadensis</i>	<i>Carex pensylvanica</i>
<i>Arabis lyrata</i>	<i>Carex virescens</i>
<i>Aralia racemosa</i>	<i>Clematis virginiana</i>
<i>Asclepias syriaca</i>	<i>Collinsonia canadensis</i>
<i>Asplenium trichomanes</i>	<i>Cornus amomum</i>
<i>Aster divaricatus</i>	<i>Corydalis sempervirens</i>
<i>Aster lateriflorus</i>	<i>Cyperus dentatus</i>
<i>Aster simplex</i>	<i>Cyperus strigosus</i>

Table 2 Cont'd.

11) Riverside cliff/outcrop community (cont'd.):

<i>Cystopteris fragilis</i>	<i>Polygonatum biflorum</i>
<i>Deschampsia flexuosa</i>	<i>Polygonum pennsylvanicum</i>
<i>Diervilla lonicera</i>	<i>Polygonum persicaria</i>
<i>Dryopteris marginalis</i>	<i>Polygonum punctatum</i>
<i>Echinochloa crusgalli</i>	<i>Polygonum sagittatum</i>
<i>Epilobium coloratum</i>	<i>Polypodium virginianum</i>
<i>Eupatorium maculatum</i>	<i>Prenanthes altissima</i>
<i>Eupatorium perforatum</i>	<i>Prunus virginiana</i>
<i>Eupatorium rugosum</i>	<i>Quercus rubra</i>
<i>Euthamia graminifolia</i>	<i>Ranunculus acris</i>
<i>Festuca ovina</i>	<i>Rhododendron maximum</i>
<i>Fragaria virginiana</i>	<i>Rhus glabra</i>
<i>Galium boreale</i>	<i>Rosa palustris</i>
<i>Geranium maculatum</i>	<i>Rubus odoratus</i>
<i>Geranium robertianum</i>	<i>Rubus pensilvanicus</i>
<i>Gnaphalium uliginosum</i>	<i>Rubus strigosus</i>
<i>Hamamelis virginiana</i>	<i>Rumex acetosella</i>
<i>Helenium autumnale</i>	<i>Rumex crispus</i>
<i>Heuchera americana</i>	<i>Rumex obtusifolius</i>
<i>Hydrangea arborescens</i>	<i>Sagina procumbens</i>
<i>Hydrocotyle umbellata</i>	<i>Sanguisorba canadensis</i>
<i>Hypericum canadense</i>	<i>Saponaria officinalis</i>
<i>Hypericum perforatum</i>	<i>Saxifraga virginiana</i>
<i>Hypericum punctatum</i>	<i>Scirpus polyphyllus</i>
<i>Ilex verticillata</i>	<i>Scrophularia marilandica</i>
<i>Impatiens capensis</i>	<i>Scutellaria lateriflora</i>
<i>Juncus tenuis</i>	<i>Sedum rosea</i>
<i>Kalmia latifolia</i>	<i>Solidago caesia</i>
<i>Leersia virginica</i>	<i>Solidago flexicaulis</i>
<i>Linaria vulgaris</i>	<i>Solidago gigantea</i>
<i>Lonicera dioica</i>	<i>Solidago juncea</i>
<i>Lycopodium clavatum</i>	<i>Solidago rugosa</i>
<i>Lycopus americanus</i>	<i>Sphagnum</i> sp.
<i>Lysimachia ciliaris</i>	<i>Spiraea latifolia</i>
<i>Lysimachia terrestris</i>	<i>Spiraea tomentosa</i>
<i>Lythrum salicaria</i>	<i>Stellaria media</i>
<i>Melilotus officinalis</i>	<i>Teucrium canadense</i>
<i>Mentha arvensis</i>	<i>Thalictrum pubescens</i>
<i>Microstegium vimineum</i>	<i>Thelypteris palustris</i>
<i>Muhlenbergia schreberi</i>	<i>Thelypteris phegopteris</i>
<i>Myosoton aquaticum</i>	<i>Tilia americana</i>
<i>Onoclea sensibilis</i>	<i>Toxicodendron radicans</i>
<i>Ostrya virginiana</i>	<i>Trillium erectum</i>
<i>Oxalis stricta</i>	<i>Tsuga canadensis</i>
<i>Panicum dichotomiflorum</i>	<i>Vaccinium angustifolium</i>
<i>Parthenocissus quinquefolia</i>	<i>Verbascum thapsus</i>
<i>Phalaris arundinacea</i>	<i>Verbena urticifolia</i>
<i>Phlox subulata</i>	<i>Viola macloskeyi</i>
<i>Physocarpus opulifolius</i>	<i>Vitis riparia</i>
<i>Pilea pumila</i>	<i>Woodsia obtusa</i>
<i>Poa compressa</i>	<i>Xanthium strumarium</i>

Table 2 Cont'd.

12) Shale cliff community

Apocynum cannabinum	Paronychia canadensis
Aquilegia canadensis	Parthenocissus quinquefolia
Arabis lyrata	Phlox subulata
Asplenium platyneuron	Polypodium virginianum
Asplenium trichomanes	Quercus ilicifolia
Aster patens	Quercus montana
Campanula rotundifolia	Quercus prinoides
Carex pensylvanica	Rhus typhina
Carya glabra	Rosa carolina
Corydalis sempervirens	Rubus sp.
Cunila origanoides	Saxifraga virginensis
Danthonia spicata	Solidago nemoralis
Deschampsia flexuosa	Toxicodendron radicans
Fraxinus americana	Triodanis perfoliata
Gaylussacia baccata	Vaccinium angustifolium
Helianthemum canadense	Vaccinium vacillans
Hypericum perforatum	Verbascum thapsus
Juniperus virginiana	Woodsia ilvensis
Krigia virginica	Woodsia obtusa
Opuntia humifusa	

13) Glacial bog (and small woodland wet areas)

Arisaema triphyllum	Lycopus americanus
Carex argyrantha	Lyonia ligustrina
Carex conjuncta	Mitchella repens
Carex incompta	Mitella diphylla
Carex stricta	Osmunda cinnamomea
Carex trisperma	Osmunda claytoniana
Clintonia borealis	Platanthera lacera
Coptis trifolia	Polygala paucifolia
Corallorhiza trifida	Ranunculus septentrionalis
Cornus canadensis	Rhododendron maximum
Dennstaedtia punctilobula	Rubus pubescens
Dryopteris spinulosa	Sambucus racemosa
Gaultheria procumbens	Spiraea alba
Glyceria striata	Spiraea tomentosa
Goodyera tessellata	Tiarella cordifolia
Hamamelis virginiana	Tsuga canadensis
Hydrocotyle umbellata	Uvularia sessilifolia
Iris versicolor	Veratrum viride
Kalmia angustifolia	
Lindera benzoin	

Table 2 (Cont'd.)

14) Graminoid marsh

Arisaema triphyllum
Carex folliculata
Carex intumescens
Carex lurida
Carex scabrata
Carex stricta
Chelone glabra

Dulichium arundinaceum
Iris versicolor
Scirpus tabernaemontanii
Senecio aureus
Spiraea alba
Spiraea tomentosa

15) Lakes and ponds (abbreviated list of characteristic species)

Dulichium arundinaceum
Lemna minor
Riccia sp.

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